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$$a\sqrt{3} + r \cos \theta, \quad \frac{a\sqrt{3}}{4} + r \sin \theta,$$

where  $PQ=r$ , and the line  $PQ$  makes an angle  $\theta$  with the  $x$ -axis. Hence, since  $Q$  lies on the curve, we have

$$2ar(\cos \theta + 8 \sin \theta) + \sqrt{3} ar^2 \cos \theta (\cos \theta + 8 \sin \theta) + 4r^3 \cos^2 \theta \sin \theta = 0.$$

One value of  $r$  is zero for all values of  $\theta$ ; hence one branch of the curve passes through  $P$ . Two more values of  $r$  are zero, when  $8 \sin \theta + \cos \theta = 0$ . Hence  $P$  is a point of inflexion. In a similar manner we can show that the other points named are points of inflexion.

Also solved by A. H. Holmes, J. Scheffer, and G. B. M. Zerr.

## PROBLEMS FOR SOLUTION.

### ALGEBRA.

265. Proposed by G. W. GREENWOOD, M. A., McKendree College, Lebanon, Ill.

Obtain the reduced cubic  $4\theta^3 - I\theta + J = 0$  of the biquadratic  $ax^4 + 4bx^3 + 6cx^2 + 4dx + e = 0$ .

266. Proposed by L. E. NEWCOMB, Los Gatos, Calif.

Find the  $n$ th term and the sum of  $n$  terms of the series  $1 + 3 + 7 + 17 + \dots$

267. Proposed by O. E. GLENN, Ph. D., Springfield, Mo.

Express the trigonometric functions of  $x$  as infinite continued fractions.

### CALCULUS.

221. Proposed by Professor F. ANDEREGG, Oberlin College, Oberlin, Ohio.

If  $a, b, c, \dots$  represent all the prime numbers 2, 3, 5, .... prove that

$$\left(1 + \frac{1}{a^2}\right) \left(1 + \frac{1}{b^2}\right) \left(1 + \frac{1}{c^2}\right) \dots = \frac{15}{\pi^2}.$$

222. Proposed by REV. R. D. CARMICHAEL, Hartselle, Ala.

Evaluate  $\int_0^1 (1+x^m)^n \log x \, dx$ .

### DIOPHANTINE ANALYSIS.

137. Proposed by REV. R. D. CARMICHAEL, Hartselle, Ala.

Prove that all multiply perfect numbers of multiplicity  $n$  having only  $n$  distinct primes are comprised in  $n=2, 3, 4$ .